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PATENT APPLICATION
Mo-5766
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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

APPLICATION OF)
)
JÖRG HOFMANN ET AL) ART UNIT: 1755
)
SERIAL NUMBER: 09/582,141) EXAMINER: E. WOOD
)
FILED: JUNE 21, 2000) RESPONSE TO PAPER NO. 7
)
TITLE: IMPROVED DOUBLE-METAL)
CYANIDE CATALYSTS FOR)
THE PRODUCTION OF POLY-)
ETHER POLYOLS)

APPEAL BRIEF

Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

This Brief, submitted in triplicate, is an appeal from the Final Office Action of the Examiner dated November 29, 2001, in which the rejection of Claims 1-7 and 9 was maintained.

I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail in an enveloped addressed to: Assistant Commissioner for Patents, Washington, D.C. 20231 05/06/02
Date
Carolyn M. Sloane - Reg. No. 44,339
Name of applicant, assignee or Registered Representative
Signature
May 6, 2002
Date

I. REAL PARTY IN INTEREST

Each of the named inventors has assigned his interest in this application to Bayer Aktiengesellschaft. Bayer Aktiengesellschaft is therefore the real party in interest in this appeal.

II. RELATED APPEALS AND INTERFERENCES

Appellants are unaware of other appeals or of any interference that would directly affect or be directly affected by, or have bearing on, the present appeal.

III. STATUS OF CLAIMS

Claims 1-7 and 9 are pending. These claims stand rejected and are the subject of this appeal. Claim 8 was cancelled by Preliminary Amendment.

IV. STATUS OF AMENDMENTS

No amendments to the claims have been made or requested subsequent to the Final Action of the Examiner.

V. SUMMARY OF THE INVENTION

Appellants' claimed invention is directed to double metal cyanide ("DMC") catalysts, the process for preparing these DMC catalysts and the use of these DMC catalysts. The DMC catalysts of Appellants' claimed invention comprise one or more DMC compounds, one or more organic complex ligands and 2 to 80 wt.% of a polycarbonate. The DMC catalysts of Appellants' claimed invention have reduced induction times and increased activity compared to known catalysts.

VI. ISSUES

Claim 9 stands rejected under 35 U.S.C. § 112, second paragraph. Additionally, Claims 1-7 and 9 stand rejected under 35 U.S.C. § 102(e) as anticipated by, or, in the alternative, under 35 U.S.C. § 103(a), as obvious in view of United States Patent No. 5,714,428 ("Le-Khac").

VII. GROUPING OF CLAIMS

The patentability of Claim 9 pursuant to 35 U.S.C. § 112, second paragraph, the patentability of Claims 1-7 and 9 pursuant to 35 U.S.C. § 102(e) and the patentability of Claims 1-7 and 9 pursuant to 35 U.S.C. § 103(a) are being argued separately. The claims do not therefore stand or fall together.

The argument pertaining to the patentability of Claim 9 pursuant to 35 U.S.C. § 112, second paragraph, is found on pages 3-4. The argument pertaining to the patentability of Claims 1-7 and 9 pursuant to 35 U.S.C. § 102(e) is found on pages 4-5. The argument pertaining to the patentability of Claims 1-7 and 9 pursuant to 35 U.S.C. § 103(a) is found on pages 5-6.

VIII. ARGUMENTS

1. Rejection of Claim 9 under 35 U.S.C. § 112, second paragraph:

Claim 9 stands rejected as being indefinite for failing to particularly point out and distinctly claim the subject matter which Appellants regard as their invention. The Patent Office believes that the Claim is indefinite for failing to set forth appropriate reaction conditions for the claimed process. Appellants respectfully submit that Claim 9 is not indefinite.

If the claim, read in light of the specification, reasonably apprises those skilled in the art both of the utilization and scope of the invention and if the claim language is as precise as the subject matter permits, then the claim is definite. *See* Hybritech Inc. v. Monoclonal Antibodies, Inc., 231 U.S.P.Q. 81 (CAFC 1986) (holding claims directed to calculating affinity are definite because calculating affinity was known in the art at the time of filing and because the claims, read in light of the specification, reasonably apprised those skilled in the art of both the utilization and scope of the invention and were as precise as the subject matter permitted).

Claim 9 of Appellants' invention is definite despite the fact that it does not recite reaction conditions for the process.

On page 9, lines 25-27 of the specification, Appellants recite the temperature ranges for the polyaddition of alkylene oxides onto starter compounds. Also, on page 9 of the specification, at line 28, Appellants disclose that the polyaddition of alkylene oxides onto starter compounds is carried out at total pressures of 0 to 20 bar. Additionally, Appellants' specification discloses that such polyadditions can be carried out without a solvent or an inert organic solvent such as toluene and/or THF, with the amount of solvent conventionally being 10 to 30 wt.%, based on the amount of polyether polyol to be prepared. *See* the Application, page 9, lines 27-31. Finally,

on page 10 of the specification, Appellants disclose the catalyst concentration used in the polyaddition reaction, as well as the polyaddition reaction times and polyaddition process methods. *See* the application, page 10, lines 1-21.

One skilled in the art, reading Appellants' specification, would be able to determine with a reasonable degree of certainty the reaction conditions for Claim 9. Claim 9, therefore, particularly points out and distinctly claims the subject matter which Appellants regard as their invention in the manner required by 35 U.S.C. § 112, second paragraph.

2. Rejection of Claims 1-7 and 9 under 35 U.S.C. § 102(e):

Claims 1-7 and 9 stand rejected as being anticipated by Le-Khac. It is the Patent Office's position that Le-Khac discloses a DMC catalyst composition containing a functionalized polymer and that this polymer can be a polycarbonate. The Patent Office concedes, however, that Le-Khac discloses many other functionalized polymers not within the scope of the instant claims. However, it is the Patent Office's position that Le-Khac anticipates Appellants' claimed invention.

In order for a reference to anticipate, it must describe Appellants' claimed invention sufficiently to have placed a person of ordinary skill in the art in possession of it. *See* Akzo N.V. v. United States Int'l Trade Comm'n, 808 F.2d 1471, 1479, 1 U.S.P.Q.2d 1241, 1245 (Fed. Cir. 1986), *cert. denied*, 482 U.S. 909 (1987). Le-Khac does not sufficiently describe Appellants' claimed invention so as to place a person of ordinary skill in the art in possession of it.

As the Patent Office concedes, Le-Khac discloses many other functionalized polymers not within the scope of the Appellants' claimed invention. The working examples in Le-Khac disclose the following functionalized polymers: poly(N,N-dimethylacrylamide); poly(1-vinylpyrrolidone); poly(1-vinylpyrrolidone-coacrylic acid); poly(vinyl methyl ether); polyether polyol; and polyester polyol. *See* Le-Khac, Examples 1-9. On the other hand, Appellants disclose, in Examples 7, 8 and 10 of their specification, that polyether polyols prepared with DMC catalysts comprising from 2 to 80 wt.% polycarbonate exhibit reduced induction times and increased activity.

None of the working examples in Le-Khac disclose a DMC catalyst comprising 2 to 80 wt.% polycarbonate. Thus, Le-Khac does not provide any

examples which show polyether polyols produced with DMC catalysts comprising 2 to 80 wt.% polycarbonate have reduced induction times and increased catalytic activity.

A working example is not necessary only if one skilled in the art would have been able to practice the invention without undue experimentation. *See* In re Borkowski and Van Venrooy, 164 U.S.P.Q. 642 (C.C.P.A. 1970). Catalyst development is an unpredictable science. *See* Exhibit 1, Kirk-Othmer, *Encyclopedia Of Chemical Technology*, 4th Ed., Vol. 5, p. 368, wherein it is stated that "[C]atalyst development is largely a matter of trial and error testing."

Given the unpredictable nature of catalysis, the skilled artisan would not have been able, without the benefit of Appellants' disclosure, to predict the change in catalytic activity disclosed by Appellants' claimed invention.

Le-Khac, therefore, does not describe Appellants' claimed invention sufficiently to have placed a person of ordinary skill in the art in possession of it. Thus, Appellants' claimed invention is not anticipated by Le-Khac.

3. Rejection of Claims 1-7 and 9 under 35 U.S.C. § 103(a):

The Patent Office rejected Claims 1-7 and 9 under 35 U.S.C. § 103(a) as being unpatentable over Le-Khac. It is the Patent Office's position that Le-Khac discloses DMC catalyst compositions containing a functionalized polymer and that this polymer can be a polycarbonate. The Patent Office concedes, however, that Le-Khac discloses many other functionalized polymers not within the scope of the instant claims. However, it is the Patent Office's position that Appellants' claimed invention would have been obvious to one having ordinary skill in the art because it would have been within the skill of the practicing artisan to select one of the possibilities disclosed by the reference.

In order to support a rejection based on obviousness, the prior art must provide a motivation or reason for the worker in the art, without the benefit of the Appellants' specification, to make the necessary changes in the reference invention. *See* Ex parte Chicago Rawhide Manufacturing Co., 226 U.S.P.Q. 438 (PTO Bd. App. 1984).

As mentioned above, Le-Khac discloses many other functionalized polymers not within the scope of the Appellants' claimed invention. The working examples in Le-Khac disclose the following functionalized polymers: poly(N,N-dimethylacrylamide); poly(1-vinylpyrrolidone); poly(1-vinylpyrrolidone-coacrylic acid); poly(vinyl methyl ether); polyether polyol; and polyester polyol. *See* Le-Khac, Examples 1-9. On the other hand, Appellants disclose, in Examples 7, 8 and 10 of their specification, that polyether polyols prepared with DMC catalysts comprising from 2 to 80 wt.% polycarbonate exhibit reduced induction times and increased activity.

None of the working examples in Le-Khac disclose a DMC catalyst comprising 2 to 80 wt.% polycarbonate. Thus, Le-Khac does not provide any examples which show polyether polyols produced with DMC catalysts comprising 2 to 80 wt.% polycarbonate have reduced induction times and increased catalytic activity.

Also, as mentioned above, a working example is not necessary only if one skilled in the art would have been able to practice the invention without an undue amount of experimentation. *See* In re Borkowski, 164 U.S.P.Q. at 643. Given the unpredictable nature of catalysis, the skilled artisan would not have been able, without the benefit of Appellants' disclosure and without undue experimentation, to predict the change in catalytic activity disclosed by Appellants' claimed invention.

In order to arrive at Appellants' claimed invention from Le-Khac's disclosure, the polycarbonates themselves would have to be discovered from the broad range of different functionalized polymers disclosed by Le-Khac. Also, in order to arrive at Appellants' claimed invention from Le-Khac's disclosure, the amount of polycarbonate to be used to prepare a DMC catalyst which can produce polyether polyols having reduced induction times and increased catalytic activity would also have to be discovered. Such discoveries could only be accomplished by using Appellants' disclosure as a blueprint to modify the teachings of Le-Khac, which is forbidden. *See* In re Rouffet, 47 U.S.P.Q.2d 1453 (Fed. Cir. 1998). Appellants' claimed invention, therefore, is not obvious in view of Le-Khac.

IX. Conclusion

Claim 9 particularly point outs and distinctly claims the subject matter which Appellants regard as their invention in the manner required by 35 U.S.C. § 112, second paragraph. The language of Claim 9 is precise. Additionally, Claim 9, when read in light of the specification, reasonably apprises those skilled in the art of both the utilization and scope of the invention.

Appellants' claimed invention achieves a goal which Le-Khac does not disclose. Given the unpredictable nature of catalysis, the skilled artisan would not have been able, without the benefit of Appellants' disclosure, to predict the change in catalytic activity disclosed by Appellants' claimed invention. Also, due to the unpredictable nature of catalysis, one skilled in the art, after reading Le-Khac, would not have found it obvious to prepare DMC catalysts comprising 2 to 80 wt.% polycarbonate which can be used to produce polyether polyols having reduced induction times and increased activity compared to known catalysts. Le-Khac, therefore, neither anticipates nor renders obvious Appellants' claimed invention.

Considering the foregoing, it is respectfully submitted that the Examiner's rejections are in error. Appellants therefore respectfully request that the rejections be reversed and that Claims 1-7 and 9 be allowed.

Respectfully submitted,

By _____

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APPENDIX: CLAIMS ON APPEAL

1. A double-metal cyanide (DMC) catalyst comprising:
   a) a double metal cyanide compound;
   b) an organic complexing ligand; and
   c) 2 to 80 wt. % of a polycarbonate, based on the amount of finished catalyst.
2. The DMC catalyst according to Claim 1, in which the double-metal cyanide compound is zinc hexacyanocobaltate(III).
3. The DMC catalyst according to Claim 1, in which the organic complexing ligand is tert-butanol.
4. The DMC catalyst according to Claim 1, in which from about 5 to 50 wt. % of polycarbonate c) is present.
5. The DMC catalyst according to Claim 1, further comprising an aliphatic polycarbonate having a hydroxyl end group and an average molecular weight below 12,000, as determined by measurement of the OH number, which is obtainable by reacting a polyfunctional aliphatic hydroxyl compound with diaryl carbonate, dialkyl carbonate, a dioxolanone, phosgene, a bischlorocarbonic acid ester or urea.
6. The DMC catalyst according to Claim 1, further comprising an aliphatic polycarbonate-diol with an average molecular weight of 400 to 6000, as determined by measurement of the OH number, which is obtainable by reacting a non-vicinal diol with diaryl carbonate, dialkyl carbonate, a dioxolanone, phosgene, a bischlorocarbonic acid ester or urea.
7. A process for the preparation of the DMC catalyst according to Claim 1, comprising the steps of:
   (a) reacting an excess of at least one metal salt in aqueous solution with at least one metal cyanide salt in the presence of the organic complexing ligand and the polycarbonate;
   (b) isolating the resultant catalyst;
   (c) washing the isolated catalyst; and
   (d) drying the catalyst.

9. A process for the production of a polyether polyol comprising reacting an alkylene oxide onto a starter compound containing active hydrogen atoms, in the presence of the double-metal cyanide (DMC) catalyst of Claim 1.

EXHIBIT 1

MoS_2 is one of the most active hydroprocessing catalysts, but it is expensive, and the economical way to apply it is as highly dispersed material on a support, γ-Al_2O_3. The activity of the supported catalyst is increased by the presence of promoter ions, Co^{2+} or Ni^{2+}. The structures of the catalysts are fairly well understood; the MoS_2 is present in layers only a few atoms thick on the support surface, and the promoter ions are present at the edges of the MoS_2 layers, where the catalytic sites are located (100,101).

The catalysts are prepared by impregnating the support with aqueous salts of molybdenum and the promoter. In acidic solutions, molybdate ions are present largely in the form of heptamers, $[Mo_7O_{24}]^{6-}$, and the resulting surface species are believed to be present in islands, perhaps containing only seven Mo ions (100). Before use, the catalyst is treated with H_2 and some sulfur-containing compounds, and the surface oxides are converted into the sulfides that are the catalytically active species.

The applications of supported metal sulfides are unique with respect to catalyst deactivation phenomena. The catalysts used for processing of petroleum residua accumulate massive amounts of deposits consisting of sulfides formed from the organometallic constituents of the oil, principally nickel and vanadium (102). These, with coke, cover the catalyst surface and plug the pores. The catalysts are unusual in that they can function with masses of these deposits that are sometimes even more than the mass of the original fresh catalyst. Mass transport is important, as the deposits are typically formed with effectiveness factors less than unity, and in the extreme case the deposits block the pore mouths. Modeling of the transport/reaction phenomena has guided the preparation of catalysts with tailored pore structures to minimize the detriment of the deposits (103). These have been some of the most fruitful applications of the principles of chemical engineering in catalyst design and preparation.

Catalyst Development, Testing, and Production

Catalysts are discovered to meet processing needs and opportunities, but the discovery of a catalytic application to take advantage of some newly discovered material almost never occurs. Catalyst development is largely a matter of trial and error testing. The methodology was defined by Haber, Bosch, and Mittasch in the development of the ammonia synthesis process. Catalyst developers benefit from an extensive and diverse literature and often can formulate good starting points in a search for candidate catalysts by learning what has been used successfully for similar reactions. Deeper insights, such as would arise from understanding of the mechanistic details of a catalytic cycle, are usually not attainable; the exceptions to this rule largely pertain to molecular catalysis, usually reactions occurring in solution. Fundamental insights were valuable in guiding the development of the process for chiral hydrogenation and that for methanol carbonylation, among others, but it would be inappropriate to infer that understanding of the fundamental chemistry led to straightforward design of the catalysts. Indeed, the initial working hypothesis about the chiral hydrogenation turned out to be incorrect. The more complicated processes of surface catalysis are for the most part only partially understood even when the processes are established and extensive